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Generalized Phase Contrast with matched filtering using LCoS pico-projectors

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We report a beam shaping system for generating high intensity programmable optical spots using mGPC: matched filtering combined with Generalized Phase Contrast applying two consumer handheld pico-projectors. Such a system presents a low cost alternative for optical trapping and manipulation, optical lattices and other beam shaping applications usually implemented with high-end spatial light modulators. Portable pico-projectors based on liquid crystal on silicon (LCoS) devices were used as binary phase-only spatial light modulators by setting the appropriate polarization of the illumination. They were subsequently placed into the object and Fourier plane of a 4f-setup based on the mGPC configuration. Having a dynamic spatial phase filter, instead of a fabricated one, allows the beam shaper to adapt to different input phase patterns suited for different requirements. Despite imperfections in these consumer pico-projector LCoS-devices, the mGPC approach tolerates phase aberrations that would have otherwise been contrasted by a standard phase imaging technique.

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